University of Botswana-Department of Statistics

STA 101: Mathematics for Social Sciences I

Test 1-2018

Total Marks:100 **Time(18:00pm-19:30pm)** **Duration:1.5 hrs**

Answer all Questions

Question 1

(a) Let the relation R be "*greater than or equals to*" on the set $A = \{2, 4, 6, 8\}$.

i) Represent the relation by an arrow diagram and write the ordered pairs of the relation.

ii) Determine, giving reasons, which of the *reflexive*, *symmetric* and *transitive* properties are satisfied by the relation R.

iii) Show that $R \subset A \times A$.

[(5+5)+(5+5+5)+5= 30 marks]

Question 2

Simplify and evaluate the following expression at the given values:

$$\left(\frac{2x^4y^2}{8x^2y^3}\right)^4, \; x = 3 \text{ and } y = 4$$

[6 marks]

Question 3

(a) Perform the indicated operation and simplify:

i) $\dfrac{x^2 - 4y^2}{4x + 8y} \div \dfrac{x^2 + 4xy + 4y^2}{x - 2y}$ ii) $\dfrac{4x^2 - y^2}{x^2 + 2xy + y^2} \cdot \dfrac{x^2 - y^2}{4x^2 - 4xy + y^2}$

[8+8= 16 marks]

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Question 4

Solve the following equation/inequality:

(a) $|2x+3| \geq 3$

(b) $x^2 + 2x - 8 = 0$

[7+7=14 marks]

Question 5

(a) If the line passing through the points $A(1, a)$ and $B(4, -2)$ is parallel to the line passing through $C(2, 8)$ and $D(-7, a+4)$, what is the value of a?

(b) Given that $2x - 3y + 1 = 0$ and $2px + 4y - 5 = 0$ are the equations of two perpendicular lines, find the value of p.

[8+8=16 marks]

Question 6

(a) If $4\log_q 3 + 2\log_q 2 - \log_q 144 = 2$, find q

(b) Solve the following equation for x: $\ln(x+6) + \ln 3 = \ln 5 + \ln 2$

(c) Solve $\log_3 4$ by changing the base to e.

[6+6+6 = 18 marks]

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